Variable Charge and Drain Voltages for Extending Lithium Battery Longevity

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Introduction

Although this author has already written a few papers on the subject of extending the useful life of lithium-ion batteries including the recommendation of the use of *fractional charge regurgitation;* that is, the purposeful redirection of a small portion of the flowing current in the opposing direction in order to randomize electron pathways through Coulomb Forces to prevent too great an amount of wear in specific, well-trodden nanoscopic zones; this approach might be combined with a second, perhaps easier-to-implement method which also serves the purpose of varying the specific pathways taken by electrons within an anode. While that earlier concept serves to attenuate nano-scale deformations, the following proposal addresses itself to micron-scale deformations.

Abstract

When a battery is designed, it is designed to be charged or discharged at a specific level of voltage with an eye toward ensuring that charge is accepted and dispensed at a rate which is as consistent as possible. Generally speaking, having a consistent output voltage is highly desirable as it reduces the requirement for the sort of capacitors which are required to handle more substantial fluctuations in the available power from the battery. However, when it comes to lithium-ion battery longevity, an approach which has not, to this author's knowledge, been attempted is to purposefully vary the amount of voltage both provided by and accepted by the battery during charge and discharge, respectively. I believe this proposed approach has gone unexplored due to the way in which it would force a change in the way that capacitors are used in electronics sc. it would require that larger capacitors be incorporated.

In this author's publication concerning the electrical dynamics of biological memory retrieval, particularly in dementia patients, this author postulated that changes in the frequency of the neural current would influence the physical depth (relative to the axon) of analog queries to human memory as well as the depth of the storage location within gray matter when one attempts to form new memories. Subsequent to my sharing of this hypothesis, researchers in South Korea demonstrated (perhaps with the benefit of having read my work and perhaps not) that dementia patients were able to form new memories which could be reliably recalled with the aid of regular ultrasound treatments which influenced the operational frequency of the brain, thereby helping the brain to avoid attempting to store new memories in areas corrupted by amyloid tangles. Although this does not allow for the unwinding of amyloid plaques or the retrieval of memories lost to those tangles, it does allow for corrupted areas to be avoided and for new memories to be, once again, formed by ensuring that subsequent attempts to store memories avoid angle-structures and favor healthy memory filaments. The new memories were accessible only with regular treatments which ensured that the altered

pathways continued to be utilized. The same principle should translate to battery anodes and the challenge of wear-prevention as voltage, be it within neurological tissue or within a metallic object, governs the behavior of electrons flowing through the medium.

If, rather than always charging or discharging a battery at 3.7 volts, for example, the battery were structurally designed to randomize or, better yet, programmatically cycle through pre-programmed voltages even when at full charge, this would cause electrons to follow different pathways through the material associated with each of the various frequencies, thereby reducing wear. In fact, such a programmatic cycling could, under certain conditions, repair wear which has already set in within old batteries, although this would be a greater technical challenge. Fundamentally, however, what is being proposed is that some infinitesimal level of wear be corrected before it develops into a serious distortion of the anode which affects performance (like nudging a water bottle a short distance and then purposefully nudging it back with the object being to keep it as near as possible to its original position.) Physical distortion to the anode at the micron- level would be spread out over different areas and, if the precise relationships between the use of specific voltages in a given anode structure could be comprehensively understood, the predictable distortion to the anode could be partially repaired through the use of voltage-cycling which would serve to correct for distortions introduced by the others. Fundamentally, it’s magnetic forces associated with individual electrons which are causing the distortions rather than thermal effects, as explained in previous publications.

In order to make practical batteries operating along such a mode of operation, electronic devices dependent upon a specific voltage would require larger capacitors if they are to function under the condition of the need to accept voltages of ranging from, perhaps, 3.2V to 4.2V whereas each frequency would be provided for perhaps 1/20th of a second at a time before a switch in voltage is automatically executed whereas the median voltage of 3.7V and whereas each voltage is provided for the same 1/20th of a second within the rotation. Battery life may be further enhanced through the use of a more complex rotation of 3.2, 4.2, 3.3, 4.1, 3.4, 4.0, 3.5, 3.9, 3.6, 3.8, and 3.7. Experimentation would be required to determine what pattern of rotation would best serve to counteract undesired anode distortion, although I predict that the ideal rotation would closely resemble the above pattern. Although the cost of each individual device powered by such a battery would be increased by the need for enhanced capacitors and the cost of each battery would be slightly increased by the need for a voltage attenuation mechanism capable of controlling output voltage, this mode of operation would extend battery life to such an extent that such a paradigm would be well-worth the investment, particularly when coupled with the fractional charge regurgitation feature.

Conclusion

This author speculates that this approach has not been tried as experiments with lithium-ion batteries have revolved around purposefully striving for the most consistent possible voltage for charge and discharge and have deliberately avoided using rotating voltage levels as inconsistent voltage is

anathema to electronics, at least doctrinally. By rotating both charge and discharge voltage through a modest redesign, lithium-ion batteries which are fundamentally similar to the extant technology could be made, with these modifications, to enjoy far greater lifespan compared to a battery which supplies and accepts charge at a single, fixed voltage. Experimentation would be required in order to quantify the precise extent of the benefit, which this author predicts to be a minimum of a 50% increase in lifespan.